Occurrences of rare and uncommon calcareous wetland plants surveyed by the Manitoba Conservation Data Centre in 2003

Manitoba Conservation Data Centre
MS 04-02
Catherine Foster
Cary Hamel
Elizabeth Reimer

Manitoba Conservation
Data Centre
Box 24, 200 Saulteaux Crescent
Winnipeg, Manitoba
R3J 3W3

105-04200/

Executive Summary

Little is known of calcareous wetland distribution in Manitoba. Calcareous fens may be one of the rarest wetland plant communities in North America (Eggers *et al.* 1997). With the objective of updating and finding new occurrences of rare plant species, the Manitoba Conservation Centre (CDC) carried out surveys of calcareous wetlands in 2003. Fifteen rare and uncommon plant species known to occur in calcareous wetlands were targeted. Twenty-three occurrences of seven of these species were documented at fifteen sites. Six occurrences of five other rare and uncommon plant species were incidentally encountered.

Scientific Name	Common Name	MB CDC Rank	2003 Occurrences
Drosera linearis	slender-leaved sundew	S2	1
Drosera anglica	oblong-leaved sundew	S3	3
Rhynchospora capillacea	horned beakrush	S2	3
Rhynchospora alba	white beakrush	S3?	3
Liparis loeselii	yellow twayblade	S3?	9
Cypripedium reginae	showy lady's slipper	S3?	3
Solidago uliginosa	bog goldenrod	S3	1

Potential threats to calcareous wetlands and the rare plants observed in 2003 include drainage, right-of way maintenance activities, all terrain vehicles, agricultural runoff, shrub encroachment, forestry, gravel extraction, peat mining and invasive species.

Acknowledgments

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Elizabeth Punter, of the University of Manitoba's herbarium, provided valuable information and suggested potential sites to be searched. Both Elizabeth Punter and Dave Punter (University of Manitoba Department of Botany) were consulted regarding past occurrences. Christie Borkowsky and Laura Reeves, of the Manitoba Tall Grass Prairie Preserve, assisted in locating previously known occurrences.

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Introduction

Canada is estimated to contain a quarter of the world's wetlands (Kennedy and Mayer 2002). In Manitoba, wetlands cover 43% of the terrestrial landscape (Halsey et al 1997). However, there is a lack of information on the distribution of calcareous wetlands in Manitoba (Jones *et al.* 1999). Calcareous fens are considered the rarest wetland plant community in Minnesota and Wisconsin (Eggers *et al.* 1997). Threats to Manitoba wetlands include drainage, agricultural runoff, off-road vehicle use, peat extraction, forestry, right-of-way maintenance, and invasion by exotic species.

In 1998 surveys in the Gull Lake area (south-east of Lake Winnipeg) identified unique calcareous wetlands capable of supporting high concentrations of rare plant species (Jones *et al.* 1999). Habitats surveyed include relatively rare calcareous fens and coniferous swamps. Fifteen rare plants were reported, including calcium loving sedges, carnivorous plants and orchids.

The Manitoba Conservation Data Centre (CDC) targeted these species and the habitats in which they occur for wetland surveys in 2003. The data collected in 2003 expands on existing information on calcareous wetlands and fills gaps in the knowledge of rare species distributions, abundance, habitat preferences and threats. Such data is critical for making informed decisions related to land management, protection, conservation status, recovery and future research.

Table 1. Rare and uncommon species observed at the Gull Lake wetlands in 1998 that were targeted in 2003.

Scientific Name	Common Name	MB CDC Rank
Arethusa bulbosa	dragon's mouth	S2
Calopogon pulchellus	swamp pink	S2
Carex sterilis	sterile sedge	S2
Cladium mariscoides	twig rush	S2
Cypripedium arietinum	ram's head lady slipper	S2?
Cypripedium reginae	showy lady's slipper	S3?
Drosera anglica	oblong-leaved sundew	S3
Drosera linearis	linear-leaved sundew	S2
Liparis loeselii	yellow twayblade	S3?
Lycopodium selago	mountian- club-moss	S2S3
Malaxis unifolia	green adder's mouth	S2?
Rhynchospora alba	White beakrush	S3?
Rhynchospora capillacea	horned beakrush	S2
Solidago uliginosa	bog goldenrod	S3
Utricularia cornuta	horned bladderwort	S3

Methods

The habitat characteristics and species assemblages observed at the Gull Lake calcareous wetlands form the basis for determining the wetland locations surveyed in 2003. Herbarium records and the CDC's database were searched for other occurrences in Manitoba of the fifteen rare plant species recorded at the Gull Lake wetlands. Promising sites with specific directions were searched based on flowering or fruiting dates in an attempt to update past occurrence data and find new occurrences. GIS themes maintained by Manitoba Conservation containing wetland, soils and forestry layers, aerial photographs and satellite imagery were consulted in an attempt to find additional locations with potentially suitable habitat. Based on information gathered using these tools, as well as discussions with knowledgeable individuals, sites with potential for supporting additional rare plant occurrences were determined. Accessible sites were ground-truthed and those with suitable habitat were searched for rare plant species between June and August of 2003.

Data on occurrences of rare plant species were recorded and mapped in a GIS application (Biotics Mapper) and its associated database (Biotics Tracker). GPS coordinates recorded in the field were used to map occurrences in the GIS and associated information was entered in the database. Data recorded for each occurrence include specific directions, a map of the boundary of the extent of occurrence, habitat preference, population abundance, density, health, associated vegetation, threats, phenology and photographs. Specimens were collected where population numbers allowed.

Scientific names follow Kartesz (1999). Global, national and subnational (G, N, S) conservation status ranks are defined in Appendix 1. All images are © Manitoba CDC unless otherwise noted.

Results

Over fifty sites were visited for calcareous wetland surveys in 2003. Twenty-one sites where occurrences had previously been recorded were visited. Several sites had become inaccessible or had been altered due to anthropogenic disturbances such as mowing, drainage and peat mining or had succeeded to more common shrub communities. Attempts to re-locate occurrences may have failed at some sites due to vague directions based on old herbarium labels. In addition, 2003 was an exceptionally dry year, which may have adversely affected some populations. For example showy lady's slipper numbers have been known to decrease in dry years. Thirty new sites were visited. Half of these sites turned out to be unsuitable habitat when ground-truthed or were inaccessible. A total of fifteen sites were found to contain 23 occurrences of the targeted species. Seven of the targeted species were observed in 2003.

All sites that contained occurrences of the targeted species displayed some characteristics of calcareous fens. All sites had accumulated peat with species indicative of circumneutral to alkaline conditions. Vegetation patterns and channels indicating slow moving water were observed at most sites. Several contained calcareous marl pools. Many sites graded into bogs or wet meadows.

Descriptions of the seven targeted plant species that were observed in 2003 are presented below. Site descriptions of the occurrences follow as several sites contained more than one rare species occurrence.

Targeted calcareous wetland species observed in 2003

Slender-leaved sundew (*Drosera linearis*) Droseraceae

G4, N4, S2

Figure 1. Slender-leaved sundew leaf.

Sundews are small insectivorous plants. Their leaves form a basal rosette from which the long leafless flower stalk arises. Gland-tipped hairs at the edges of the leaves trap insects attracted by their reddish colour and sweet scent of secreted fluids (Fig. 1). The small white flowers terminate the flower stalk and produce seed-containing capsules.

Three species of sundew occur in Manitoba. The round-leaved sundew (*Drosera rotundifolia*) is the most common (S5), the oblong-leaved sundew (*Drosera anglica*) is uncommon (S2) and the slender-leaved sundew (*Drosera linearis*) is the rarest of the three (S1). The three species of *Drosera* may be distinguished based on leaf and fruit morphology.

The slender-leaved sundew bears linear leaves, with parallel edges, up to 6 cm long (Scoggan 1957). The flower stalk is 4-10 cm high and bears a single or few flowers (Looman and Best 1987). The seeds are rhomboidal and densely shallow-pitted. It flowers from June to August (Johnson 1981).

Slender-leaved sundew is restricted to Canada and several of the northern states that border Canada (NatureServe 2003). It is considered rare (S2) in Manitoba, where it has been recorded from calcareous fens to the south-west of Gull Lake, to the north-east of Katimik Lake (north-east of Lake Winnipegosis) and near Carberry (Fig. 2). It has also been reported from God's River, Roseau River and Whitemouth Bog. This species tends to prefer richer calcareous areas than the other two species found in Manitoba (Johnson 1981). One occurrence of slender-leaved sundew was observed in 2003.

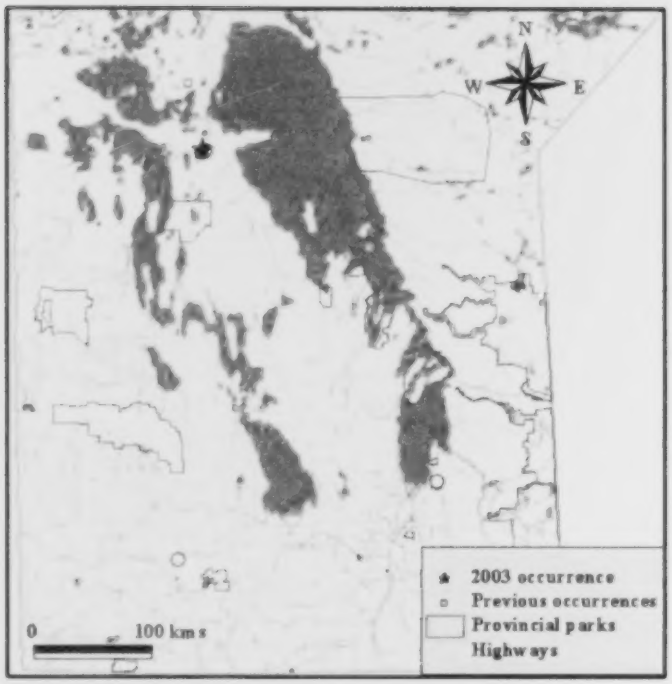

Figure 2. Slender-leaved sundew occurrence.

Oblong-leaved sundew (*Drosera anglica*) Droseraceae

G5, N?, S3

Figure 3. Oblong-leaved sundew.
(© C. Ladyka)

The oblong-leaved sundew bears leaves that tend to be wider towards the tip and are usually under 2.5 cm long (Scoggan 1957) (Fig. 3). The flower stalk grows to 4-10 cm and usually bears more than one flower (Looman and Best 1987). The seeds are spindle-shaped with a loosely honeycombed outer coat. It flowers from late June in the south to late August in the north (Johnson 1981).

Oblong-leaved sundew is uncommon (S3) in Manitoba and until recently was believed to be a hybrid of the other two species that occur here (Gillian and Davis 2003). It is a circumboreal species (Gleason and Cronquist 1991) and in Manitoba ranges from the south-east to Riding Mountain National Park and north to the border (Fig. 4). Although this species occurs in less calcareous bogs and fens it also occurs in richer habitats where slender-leaved sundew occurs (Johnson 1981). Three occurrences of oblong-leaved sundew were observed in 2003.

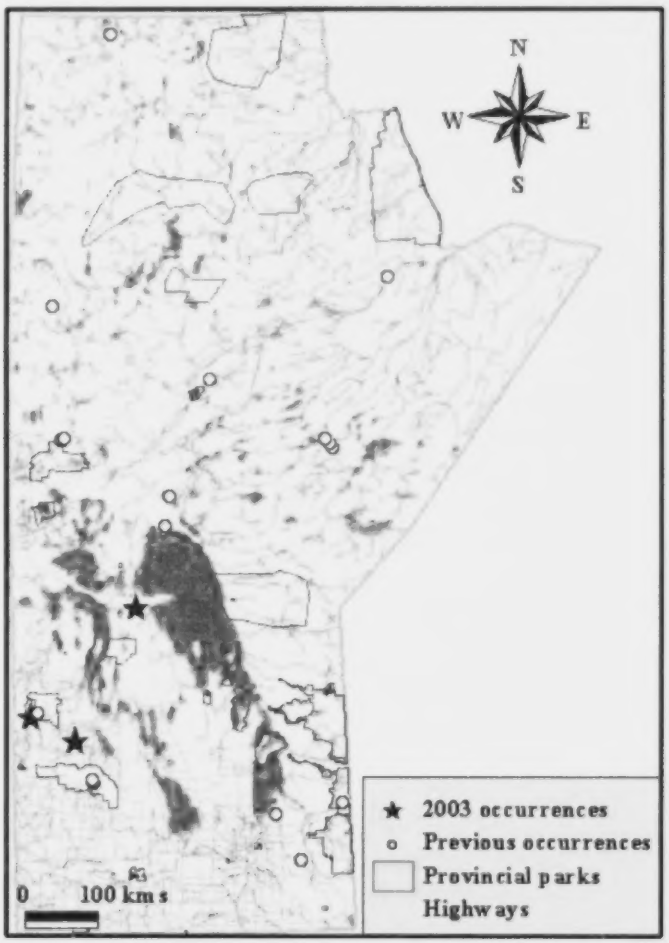

Figure 4. Oblong-leaved sundew occurrences.

Horned beakrush (*Rhynchospora capillacea*) Cyperaceae

G4G5, N?, S2

Figure 5. Horned beakrush inflourescence.
(© J.J. Emmet, University of Wisconsin-Stevens Point)

Horned beakrush (*Rhynchospora capillacea*) and white beakrush (*Rhynchospora alba*) are the only two species of the genus *Rhynchospora* occurring in Manitoba. Although the common name is beakrush they belong to the sedge family (Cyperaceae). Beakrushes have 3-edged stems that grow in tufts, often forming tussocks (Scoggan 1978). The leaves and stems are very narrow. Flowers have bristles instead of petals or sepals and are borne in 1-3, branched flower clusters (Flora of North America Editorial Committee 2002). Unlike *Carex*, the largest genus of the sedge family, beakrushes have bisexual flowers. The flowers and seeds (achenes) are protected by scales rather than being enclosed in a membranous sac (periginium). Beakrushes are further differentiated from other sedges based on achene morphology. Several downward barbed (sometimes smooth) bristles protrude from the base of the flattened achene. The two stigmas protruding from the achene are thickened at the base, forming a cone shaped tubercle that terminates the achene after the stigmas fall off. The most obvious difference between the two beakrushes that occur in Manitoba is the number of achene bristles.

Horned beakrush grows to10-40 cm tall (Flora of North America Editorial Committee 2002). The leaves usually do not reach more than 0.5 mm wide (Scoggan 1978). The scales of the inflorescence are pale red-brown to brown (Fig. 5). There are 6 bristles attached to the base of the achene. The achenes are pale brown and appear from summer to fall (Flora of North America Editorial Committee 2002).

Horned beakrush is restricted to North America occurring in eastern United States and from coast to coast across the Canadian provinces (Flora of North America Editorial Committee 2002, NatureSeve 2003). It is considered rare (S2) in Manitoba where it has been recorded in southeastern Manitoba from the Gull Lake area and north of Moose Lake, and in western Manitoba from Duck Mountain Provincial Park near Shell River and south of Birch River (Fig. 6). It has also been reported from Washow Bay along the east side of Lake Winnipeg and north of Seddons corner off Highway 44. Horned beakrush is a calcium loving species that occurs in rich fens (Flora of North America Editorial Committee 2002). Three occurrences if horned beakrush were recorded in 2003.

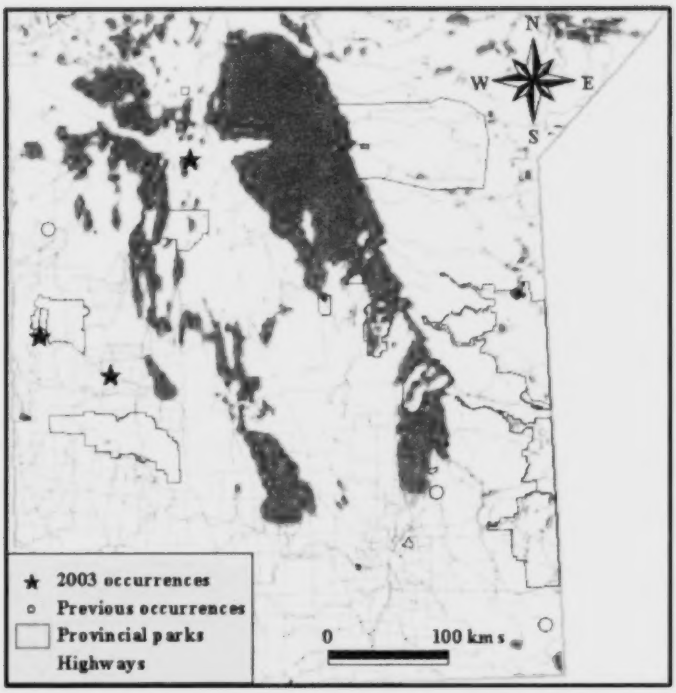

Figure 6. Horned beakrush occurrences.

White beakrush (*Rhynchospora alba*) Cyperaceae

G5, N?, S3?

Figure 7. White beakrush in flower.
(© Joanne Kline , University of Wisconsin – Stevens Point)

White beakrush is 6-75 cm tall (Flora of North America Editorial Committee 2002). The leaves are less than 2.5 mm wide (Scoggan 1978). The inflorescence scales are pale brown to white (Fig. 7). There are 8 or more bristles attached to the base of the achene (Scoggan 1978). The achenes are pale brown with a paler centre and appear from summer to fall (Flora of North America Editorial Committee 2002).

White beakrush occurs in North America, Eurasia and Puerto Rico at higher elevations (NatureServe 2003). The species was first recorded in Manitoba in 1983 and is tentatively ranked S3? (uncommon). Provincially it occurs in a narrow band from Whitemouth Bog in the south-east to Stall Lake, Flin Flon in the north-west (Fig. 8). While this species occurs in more acidic sphagnous bogs it also occurs in richer fens (Flora of North America Editorial Committee 2002). Three occurrences of white beakrush were recorded in 2003.

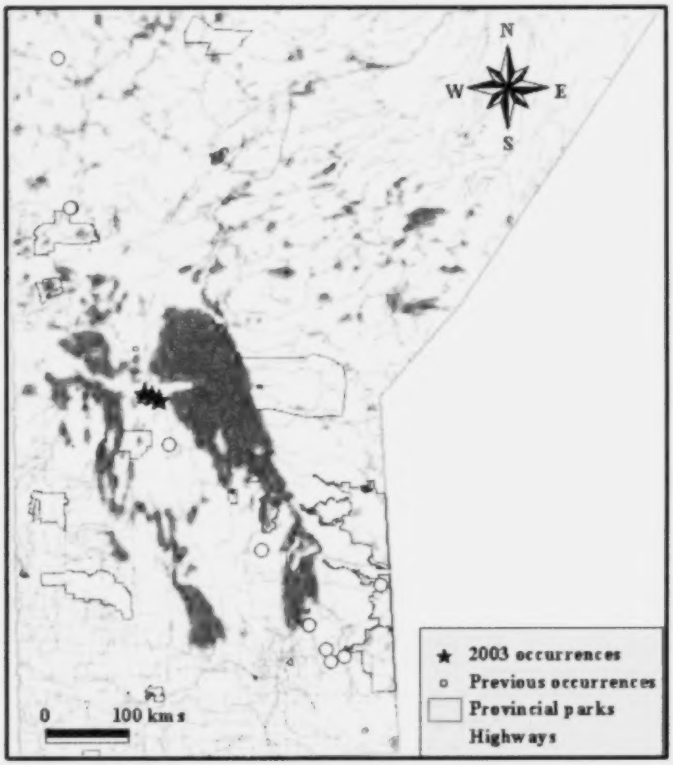

Figure 8. White beakrush occurrences.

Yellow twayblade (*Liparis loeselii*) Orchidaceae

G5, N?, S3?

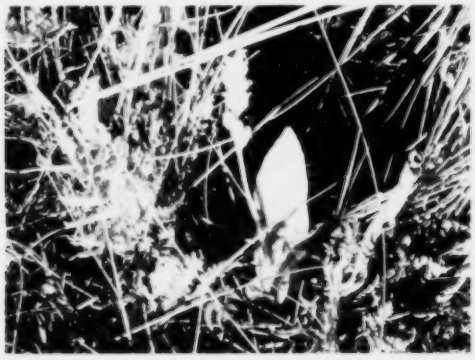

Figure 9. Yellow twayblade in fruit at Whitemouth Bog.

Yellow twayblade is a small (5-26 cm high) orchid bearing a spike-like raceme of 3-19 small (6 mm) yellowish-green flowers, on short (5 mm) ascending branches, that terminates the stem (Scoggan 1978; Smith 1993). It has two keeled leaves that sheath the ribbed stem near the base. The plant arises from a solid bulb and flowers from mid-June to the end of July. It produces seed capsules that grow to over 1 cm long. This is the only species of the genus *Liparis* that occurs in Manitoba (Fig. 9).

Yellow twayblade occurs in northeastern United States, Europe and all Canadian provinces except Alberta and Labrador (NatureServe 2003). In Manitoba it ranges from southeastern Manitoba to west central Manitoba with a disjunct occurrence at South Indian Lake (57°N) (Fig. 10). It tends to prefer wet organic soils although it may also occur on drier mineral soils. Known for its tolerance of nutrient extremes it can grow in calcareous pools with a pH as high as 8.3 (Smith 1993). In Manitoba it is tentatively ranked S3? (uncommon). Usually an occurrence contains only a few plants. Nine occurrences were observed in 2003.

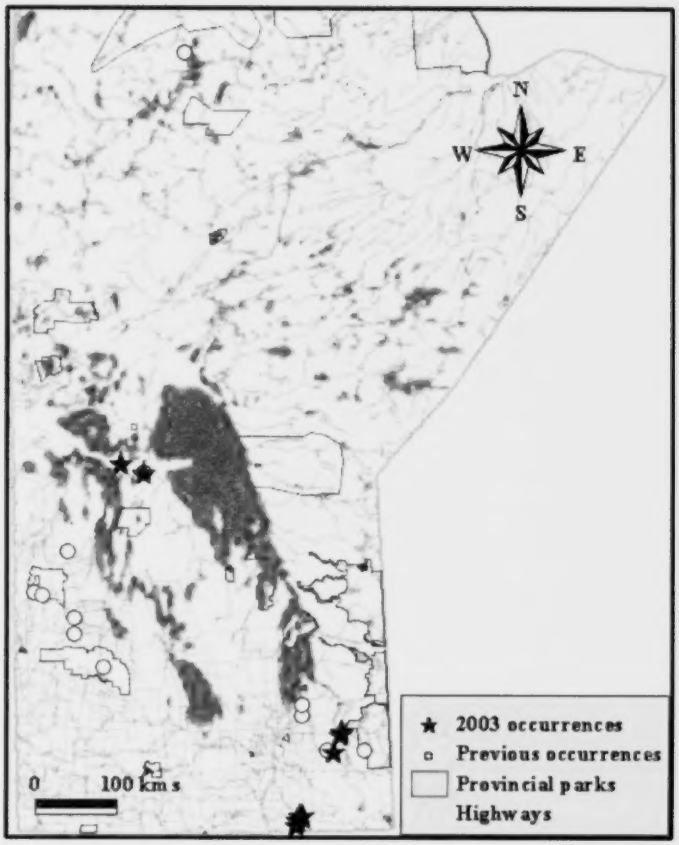

Figure 10. Yellow twayblade occurrences.

Showy lady's slipper (Cypripedium reginae) Orchidaceae

G4, N?, S3?

Figure 11. Showy lady's slipper.

Showy lady's slipper is a large orchid that grows up to 30-60 cm tall (Looman and Best 1987). Four to twelve large (8-12 cm long) hairy, ribbed leaves clasp the stem. One to three large flowers terminate the stem from early June to mid-July (Smith 1993). The lip of the flower is a white inflated pouch (3-4 cm long) stained with pink (Fig. 11).

Showy lady's slipper occurs in eastern North America (NatureServe 2003). In Manitoba it ranges from the south-east to The Pas with over 35 occurrences known (Fig. 12). Occurrences are generally restricted to wetlands in calcareous areas. Provincially it is tentatively ranked S3? (uncommon). In addition to general wetland threats showy lady's slipper is threatened by picking. CITES (Convention on International Trade in Endangered Species Protection Status) lists the species under Appendix II. Three occurrences of showy lady's slipper were recorded in 2003.

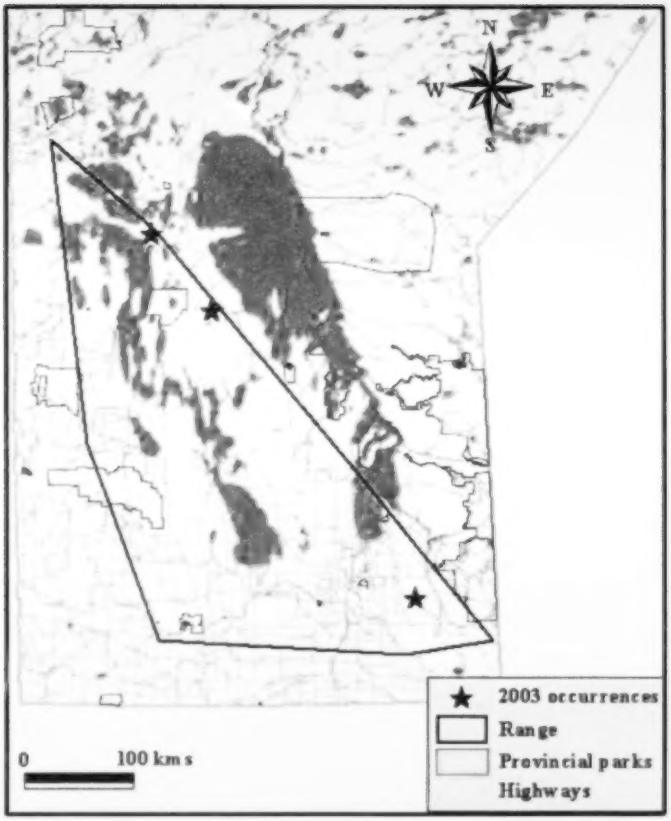

Figure 12. Showy lady's slipper range and 2003 occurrences.

Bog goldenrod (*Solidago uliginosa* var. *linoides*) Asteraceae

G4G5, N?, S3

Figure 13. Bog goldenrod at Whitemouth Bog.

Bog goldenrod is a tall narrow member of the aster family, with a long, narrow, yellow inflorescence and long leaves arranged alternately along the reddish stem (Fig. 13). The variety of bog goldenrod that occurs here generally does not grow over 1m in height and has less than 20 leaves (Scoggan 1978). The lower leaves are shallowly toothed and taper to a petiole, which partly sheaths the stem. They become much smaller along the upper stem, lacking teeth and petioles (Semple *et al.* 1999). The small yellow composite flower heads are attached to floral branches by short peduncles. Flowers bloom in mid to late summer and produce smooth achenes.

Our variety of Bog goldenrod is restricted to northeastern North America (NatureServe 2003). It reaches its northwestern limit in Manitoba where it occurs along the southeastern edge of the province (Fig. 14). Bog goldenrod typically occurs in bogs although tetraploids have been known to occur in more calcareous habitats (Semple 1999; Gleason and Cronquist 1991). There are usually only a few plants at an occurrence. In Manitoba it is uncommon (S3). One occurrence was observed in 2003.

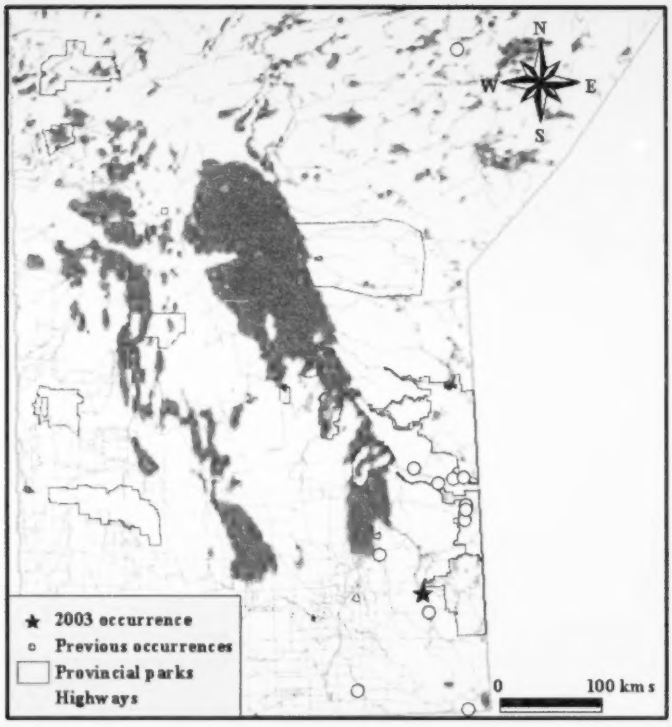

Figure 14. Bog goldenrod occurrences.

Occurrences of targeted calcareous wetland species observed in 2003

Southeastern Occurrences

The southeastern sites visited contained seven occurrences of yellow twayblade, one occurrence of bog goldenrod and one of showy lady's slipper.

Highway 15

On June 2 yellow twayblade was re-located at a previously known occurrence in an open fen on the south side of Highway 15 approximately 6.5 km past Ste. Rita. The fen is approximately 700m x 100m and is bounded by the highway and a railway to the south (Fig. 15). Tamarack, white spruce, bog birch and willows border the southern edge of the fen. Horsetails (*Equisetum* spp.) dominate the site along with rushes (Juncaceae) and members from the sedge family (Cyperaceae), including bulrushes (*Scirpus* spp.), cotton-grass (*Eriophorum* spp.) and sedges (*Carex* spp.). The herbaceous layer is relatively diverse including several orchid species along with plants typically found in fens such as sticky false asphodel (*Tofieldia glutinosa*), shrubby cinquefoil (*Potentilla fruticosa*), and flat-leaved bladderwort (*Utricularia intermedia*) in shallow water channels.

Yellow twayblade was scattered throughout the central and eastern portions of the fen occurring along the edges of shallow pools. Ten plants were counted, all in flower. Several plants of showy lady's slipper (*Cypripedium reginae*) were also flowering. Holes had been dug adjacent to some of the showy lady's slippers indicating plant collection as a possible threat at this site. A single plant of swamp-pink (*Calopogon tuberosus*) (S2) was recorded at this site in 2001 but was not observed in 2003. Rose pogonia (*Pogonia ophioglossoides*) is a very rare orchid (S1) known from this site (Fig. 16). In 2003 it occurred in small, scattered patches and was locally abundant at the west end and at the edges of the fen. The total population of rose pogonia was estimated to be in the hundreds. This site could be threatened by road and ditch maintenance activities.

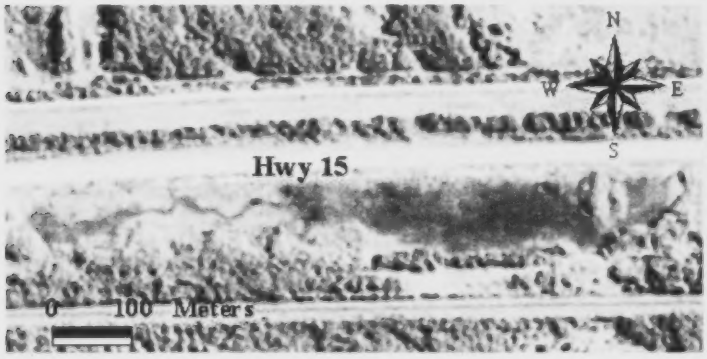

Figure 15. Aerial photo of Highway 15 fen.

Figure 16. Rose pogonia.

Tall Grass Prairie Preserve

The southernmost sites searched were on the Tall Grass Prairie Preserve in the RM of Stuartburn (Fig. 17). Four occurrences of yellow twayblade were observed. One occurrence was updated on July 3 in a ditch on the south side of Highway 209. The population was estimated to contain less than 50 plants with approximately 90% in bloom. Occurrences of cynthia (*Krigia biflora*) (S2) and yellow stargrass (*Hypoxis hirsuta*) (S3) were also recorded at this site. Ditch maintenance activities could potentially threaten these populations.

Two occurrences on the north block of the preserve were observed on July 4. An occurrence reported by staff at the preserve in 2002 was updated. Four plants were observed approximately 5 km north of the junction of 201 and 209. Three plants had bloomed and were beginning to set seed. They were growing in 15 cm of water along a trail in a swale. Approximately 2 km further east a new occurrence was observed consisting of one plant beginning to set seed. Yellow stargrass was also recorded at this site. Major drainage projects continue in this area.

On August 27 a fourth occurrence was found 3.2 km east of Stuartburn in an undeveloped right-of-way on the north side of Highway 201. A small patch of six plants, in fruit, was recorded. Occurrences of Ridell's goldenrod (*Solidago ridellii*) (S2) and narrow-leaved gerardia (*Agalinis tenuifolia*) (S2S3) were also recorded at this site. Exotic species observed at these sites included smooth brome (*Bromus inermis*), canada thistle (*Cirsium arvense*) and clover (*Trifolium* sp.). A high number of rare plant species occur on the Tall Grass Prairie Preserve and surrounding areas in the municipality of Stuartburn. The state of these occurrences was reviewed through field work and consultation with staff from the Preserve in 2003 (Hamel *et al.* 2004).

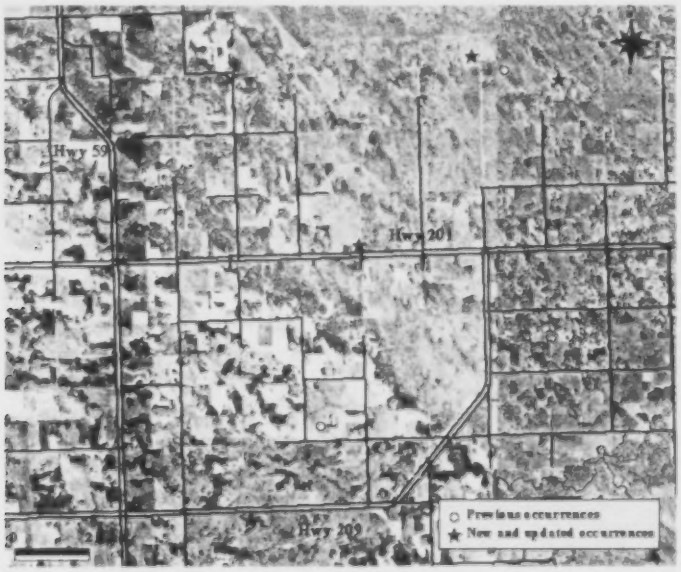

Figure 17. Yellow twayblade occurrences at the Tall Grass Prairie Preserve.

Whitemouth Bog

Four sites at Whitemouth Bog, a large peatland complex situated between Agassiz Forest Reserve and Whiteshell Provincial Park, were visited on July 15 and 16. New occurrences were observed at two of these sites. Yellow twayblade and bog goldenrod were both found on the north-west end of Whitemouth Bog, in an undeveloped right-of-way, approximately 1 km from the end of Big Rock Road (Figs. 9 and 13). This site was one of the wettest sites surveyed in 2003, a very dry year. Associated taxa include a large component from the sedge family, rushes, horsetails, ferns, willows, flat-leaved bladderwort, seaside arrow-grass (*Triglochin maritime*) and other herbs commonly found in fens. Four plants of yellow twayblade, two of which were in fruit, were observed growing around hummocks. In the immediate vicinity a new occurrence of bog golden rod was recorded. Four plants were observed not yet in full bloom.

Approximately 3.75 km to the north-east another new occurrence of yellow twayblade was found in a hydro right-of-way east of Homestead Road (Fig. 18). Three plants were recorded, all in fruit, growing around hummocks. This site was dominated by graminoids (sedges, rushes and grasses). Common reed grass (*Phragmites australis*), a species known to invade calcareous fens also occurs at this site. Yellow twayblade has been previously reported from Whitemouth Bog (Liz Punter, pers. comm.). Previously known occurrences of slender-leaved sundew and white beakrush have also been recorded from this vicinity but were not observed at the sites visited in 2003. Drainage is a potential threat to occurrences in Whitemouth Bog.

Figure 18. Hydro right-of way at the north-west end of Whitemouth Bog containing a yellow twayblade occurrence.

Northern Occurrences

The northernmost sites visited were located to the south-west of Grand Rapids. Ten occurrences were recorded for six of the targeted species; three of white beakrush, two of yellow twayblade, two of showy lady's slipper, and one each of horned beakrush, oblong-leaved sundew and slender-leaved sundew.

Highway 6

Two sites were visited along Highway 6. Several rare species have been recorded from an open fen south of Devil's Lake on the east side of Highway 6 under hydro transmission lines. The site visited in 2003 was 5.6 km south of the Devil's Lake picnic site (Fig. 19). The fen slopes gently away from jack pine along the highway towards black spruce and tamarack to the east. Plant diversity is relatively high at this site. Associated taxa include graminoids, bog birch, shrubby cinquefoil, round-leaved sundew, pitcher plants (*Sarracenia purpurea*), fringed gentian (*Gentianella crinita*), grass-of parnassus (*Parnasia sp*), sticky false asphodel, horsetails and mosses. Showy lady's slipper was observed at this site in low abundance. Rare and uncommon species previously recorded from this area but not observed in 2003 include sterile sedge (*Carex sterilis*), twig rush (*Cladium mariscoides*), horned bladderwort (*Utricularia cornuta*) and white beakrush. The invasive reed canary grass (*Phalaris arundinacea*) was also observed here. Gravel extraction was taking place upslope of the fen and could alter the water supply to the fen.

Figure 19. Fen south of Devil's Lake containing an occurrence of showy lady's slipper.

A new occurrence of white beakrush was recorded from the north-east ditch of Highway 6 approximately 10 km south of Highway 60 (Fig. 20). It was not abundant at this location, being restricted to the edges of shallow water. The site was visited on August 18 when many of the plants were fruiting. Graminoids dominate the site along with horsetails and calcium loving plants such as sticky false asphodel, shrubby cinquefoil and grass-of-parnassus. The invasive common reed grass also occurs along this ditch. Numerous sites along Highway 6 contained similar habitat containing calcareous pools.

Figure 20. White beakrush occurrence off Highway 6.

Highway 60

Several peatland complexes occur along Highway 60. The first of these starts approximately 2 km west of Highway 6 on the south side of Highway 60 and continues west for about 4 km. It is an open fen dominated by graminoids along with mosses, seaside arrow grass, pitcher plants and other herbs typically found in peatlands (Fig. 21). The fen is surrounded by cedar, tamarack, black spruce and bog birch. Two new occurrences were recorded at the east end of the fen; one for white beakrush and another for oblong-leaved sundew. White beakrush was abundant, widespread and fruiting (August 18). Oblong-leaved sundew was found growing on mossy hummocks and was also in fruit.

Figure 21. The first fen searched along Highway 60 containing occurrences of white beakrush and oblong-leaved sundew.

Approximately 3 km further west along the south side of Highway 60 is a separate fen complex to the north-east of Katimik Lake. It is an open fen running for 3 km west along the highway and is dominated by graminoids along with horsetails, mosses, pitcher plants, grass-of-parnassus and other fen species, with islands of stunted black spruce, tamarack, cedar and bog birch (Fig. 22). Three occurrences were recorded at the west end of the fen on August 19 for yellow twayblade, white beakrush and slender-leaved sundew. Yellow twayblade was patchy and fruiting. White beakrush was one of the dominant species occurring at this site. The population was healthy and bearing fruit. The slender-leaved sundew occurrence was patchy on mossy hummocks. The population was healthy with many plants bearing fruit. Both white beakrush and slender-leaved sundew have been previously recorded from this vicinity.

Figure 22. Fen north-east of Katimik Lake containing white beakrush and oblong-leaved sundew occurrences.

Approximately eight km further west there is a small calcareous fen at the north-west end of Katimik Lake. A new occurrence of horned beakrush was recorded from this site (Fig. 23). The fen slopes gently towards the lakeshore a few hundred metres away. It is surrounded by cedar, tamarack, black spruce and bog birch. Graminoids dominate the site along with calcareous fen species such as grass-of parnassus and sticky false asphodel. Horned beakrush was abundant and in fruit at the north end of the fen growing in dried up calcareous pools. The fen is adjacent to a road and an ATV trail.

Figure 23. Horned beakrush occurrence north-west of Katimik Lake.

Highway 327 (Easterville Road)

Several sites were searched along Highway 327 (Easterville Road) on August 19.Yellow twayblade had been previously reported to occur along this stretch. An occurrence was found approximately 15 km south of Easterville on the east side of Highway 327. Graminoids and mosses dominated the site along with stunted black spruce, tamarack, cedar, bog birch and shrubby cinquefoil forming islands and surrounding open areas (Fig. 24). The yellow twayblade occurrence was small, patchy and fruiting. Plants tended to occur at the edges of open areas on mossy hummocks. Showy lady's slipper was also recorded at this site in low abundance.

Figure 24. Site off Highway 327 containing occurrences of yellow twayblade and showy lady's slipper.

Western Occurrences

Horned beakrush and oblong-leaved sundew were both recorded at Shell River trail in Duck Mountain Provincial Park and north-east of Broken Pipe Lake on August 20. Both sites are open, slightly sloping, graminoid dominated calcareous fens with a high diversity of calcium loving plant species including grass-of-parnassus, sticky false asphodel, seaside arrow-grass, shrubby cinquefoil, Kalm's lobelia (*Lobelia kalmii*), fringed gentian, bog muhly (*Muhlenbergia glomerata*) and common butterwort (*Pinguicula* sp.). The fens are surrounded by tamarack and black spruce that sometimes form stunted islands within open areas. Shallow calcareous pools are extensive at both sites.

Shell River, Duck Mountain Provincial Park

This small calcareous fen is located on the north side of the Shell River valley hiking trail. Horned beakrush was patchy but fairly abundant, occurring in dense tufts in dried up calcareous pools (Fig. 25). The population appeared healthy and was in fruit. Horned beakrush was recorded from this vicinity in 1975, occurring on a black spruce hummock. Oblong-leaved sundew was not very abundant and was associated with mossy hummocks in calcareous pools. Some plants were fruiting. Oblong-leaved sundew has previously been reported to occur in the Shell River valley. Sterile sedge (*Carex sterilis*) (S2) was observed in this area in 1972 but was not observed in 2003. The calcareous pools were quite dry and had been visited by many ungulates, as indicated by droppings and tracks. A boardwalk crossing the horned beak-rush occurrence has been removed and the hiking trail has been diverted from the fen (Doug Tirschman, pers. comm.).

Figure 25. Horned beakrush and oblong-leaved sundew occurrences at Shell River trail.

Broken Pipe

This site is north of Broken Pipe Lake and east of Highway 10. The fen is quite small (less than 350 x 100 m) and straddles a gravel road. The horned beakrush population was quite abundant north of the gravel road forming patterns in relatively deep calcareous pools (Fig. 26). Oblong-leaved sundew tended to occur around mossy hummocks in calcareous pools. Both populations were healthy and producing seed. This site was much wetter than the Shell River site. Moose tracks were observed, as well as evidence of beaver activity. What appeared to be a winter road was running through the middle of the fen south of the gravel road (Fig. 27). Sterile sedge was also recorded from this vicinity in 1983 but was not observed in 2003.

Figure 26. Horned beakrush and oblong-leaved sundew occurrences at Broken Pipe Fen north of gravel road.

Figure 27. Broken Pipe fen south of gravel road.

Conservation Issues

Threats

Potential threats to rare calcareous plant occurrences observed in 2003 include drainage and maintenance activities at ditch and right-of way occurrences, particularly in southern Manitoba. The CDC is currently preparing a map of occurrences for the Tall Grass Prairie Preserve and surrounding areas in the RM of Stuartburn to increase awareness of rare species occurrences and promote mitigation measures (Hamel *et al.* 2004). ATV use is also a threat at several sites. Regional offices have been made aware of rare species occurrences threatened by ATV use in Duck Mountain Provincial Park and are addressing such threats through signage and re-routing of trails. The fens at Shell River Trail and Broken Pipe have been singled out as having potential for Ecological Reserve status and/or other legal protection. Other threats to sites visited in 2003 include agricultural runoff, invasive species, shrub encroachment, forestry, gravel extraction and peat mining (Fig. 28).

Figure 28. Peat mined site at previously known occurrence of swamp pink (*Calopogon pulchellus*) (S2) at Moss Spur, 2003.

Management

The Nature Conservancy (2004) describes calcareous fens as temporary, early successional habitats dependent on natural disturbance such as wind storms, lightning strikes, beaver, grazing by moose and other large herbivores, and fire to prevent encroachment by shrubs and trees. The Nature conservancy has conducted prescribed burns in calcareous fens as well as invasive plant management to control species that pose a threat to these habitats, such as common reed grass (*Phragmites australis*). This species and other invasives were present at several of the sites visited in 2003. The Tall Grass Prairie Preserve employs burning, grazing and mowing to reduce encroachment by woody species and decrease litter build-up. Several occurrences of yellow twayblade are located on the Preserve. This species may favour moderate disturbances, although herbivory may have a significant negative impact over multiple years (McMaster 2001). For some types of disturbances there may be a fine line between those that benefit and those that negatively impact fens. For example trampling and trail cutting by ungulates and beavers may alter hydrology and increase the potential for encroachment of invasive species. The effects of grazing and mowing on rare species of calcareous fens remain poorly understood.

Future Research

Throughout the course of surveys in 2003, several sites were identified as having potential for rare species occurrences but were not searched due to inaccessibility or time constraints. Several promising sites that were searched in late summer could be re-visited earlier in the season. Sundews, beakrushes and yellow twayblade are easily overlooked and likely under-recorded. Additional searches and formal documentation of occurrences could ultimately lead to changes in the ranks of some of these species.

Calcareous fen communities would benefit from the development of quality assessment criteria, restoration guidelines and buffer guidelines. Protection efforts should focus on the fens as well as recharge areas, which may occur some distance from the fen itself. The Minnesota Wetlands Conservation Plan (1997) includes such activities for the conservation of calcareous fens, which have been accorded special protection under state law. Research involving exclosures could also be helpful in identifying the pros and cons of grazing, beaver activity and other disturbances. Many aspects of the biology and ecology of calcareous fen species remain unknown.

Increased awareness of these communities, their distribution, threats, and management alternatives is needed, particularly by land managers and conservation agencies.

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Appendix: Definitions of Conservation Status Ranks

Adapted from the Manitoba CDC website, 1998.

Species are evaluated and ranked by the Conservation Data Centre on the basis of their range-wide (global - G) status, nation-wide (national – N) status, and province-wide (subnational - S) status according to a standardised procedure used by all Conservation Data Centres and Natural Heritage Programs. These ranks are used to determine protection and data collection priorities and are revised as new information becomes available.

For each level of distribution—global, national, and provincial—species are assigned a numeric rank ranging from 1 (very rare) to 5 (demonstrably secure). This reflects the species' relative endangerment and is based primarily on the number of occurrences of that species globally, nationally, or within the province. However, other information, such as date of collection, degree of habitat threat, geographic distribution patterns and population size and trends, is considered when assigning a rank. The numbers of occurrences listed below are suggestions, not absolute criteria. For example, the Green Frog (*Rana clamitans*) is ranked G5, S2. That is, globally the species is abundant and secure, while in Manitoba it is rare and may be vulnerable to extirpation.

Rank	Definition
1	Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.
2	Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.
3	Uncommon throughout its range or in the province (21 to 100 occurrences).
4	Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).
5	Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially irradicable under present conditions.
U	Possibly in peril, but status uncertain; more information needed.
H	Historically known; may be rediscovered.
X	Believed to be extinct; historical records only, continue search.